

## **Workshop on the Detection, Classification, Localization and Density Estimation of Marine Mammals Using Passive Acoustics - 2015**

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### **LONG-TERM GOALS**

The goal of this project was to bring together the community of researchers working on methods for detection, classification, localization and density estimation of marine mammals using passive acoustics, and by doing so advance the state of the art in this field.

### **OBJECTIVES**

The Seventh International Workshop on Detection, Classification, Localization, and Density Estimation (DCLDE) of Marine Mammals Using Passive Acoustics was organized and held at the Scripps Institution of Oceanography (SIO) in July 2015. The objective of ONR support for the workshop was to facilitate its organization and to increase the level of participation by students and others working in the field.

### **APPROACH**

The DCLDE was held over July 13-16, 2015 at the SIO Forum, with 131 people in attendance. The workshop was organized around talks and posters, with time allowed for questions and discussion. A workshop dataset consisting of annotated and unannotated marine mammal sound data was released prior to the event. The workshop local organizing committee consisted of John Hildebrand, Marie Roch, Simone Baumann-Pickering, and Ana Širović.

### **WORK COMPLETED**

A website was created ([www.cetus.ucsd.edu/dclde](http://www.cetus.ucsd.edu/dclde)) to describe the workshop, to aid in delivery of the meeting dataset, and in the submission of abstracts. The website also allowed participants to register for the workshop and provided other logistical information. The workshop was held over 4 days with the following day devoted to technical meetings on towed array acoustics.

For the 2015 DCLDE workshop, multiple sound datasets were created to address some of the gaps identified in discussions at previous workshops. In particular, large training and testing datasets were

provided that covered some of the range of spatial, temporal, and recording variability that is encountered by researchers in the field. We hope that these datasets provide an opportunity to develop detectors and classifiers that will perform more robustly across different tasks and in new conditions.

Two different bandwidth datasets were provided, one focusing on high-frequency (up to 160 kHz) and one on low-frequency (up to 1.6 kHz) signals. The high-frequency dataset consists of marked encounters with echolocation clicks of species commonly found along the US West Coast, including Cuvier's and Baird's beaked whales, Risso's and Pacific white-sided dolphins, sperm whales, unidentified porpoises and unidentified odontocetes. The low-frequency dataset contains call-level markings for blue whale D calls and fin whale 40 Hz calls. In both cases, the recordings were collected with High-frequency Acoustic Recordings Packages (HARPs) deployed off the southern and central coast of California at different locations, spanning all four seasons. The workshop datasets have been provided by Ana Širović and Simone Baumann-Pickering of the Scripps Institution of Oceanography.

## **RESULTS**

A total of 131 people attended the DCLDE and approximately one-third of these identified themselves as students. The presentations numbered 85, with 57 delivered as 20 minute talks, and 28 delivered as 3 minute talks with associated posters. Talks on the first day of the meeting focused on detection and classification; those on the second day on detection/classification and localization; those on the third day on density estimation and the meeting dataset; and those on the last day on density estimation and other topics.

The day following the workshop, two sessions were conducted on towed array passive acoustics chaired by Aaron Thode and Robert Valterra.

## **IMPACT/APPLICATIONS**

The DCLDE 2015 achieved its goal of bringing together the research community working on marine mammal acoustics to discuss detection, classification, localization and density estimation methods and approaches. A variety of state-of-the-art talks and posters were presented and new methods were described and discussed. Students fully participated in the meeting and were able to interact with the international community of researchers.

The next venue for the DCLDE workshop, which will be held in 2017, was selected to be the Alfred Wegener Institute in Germany. In addition, it was decided that Hawaii would be designated as the venue for the 2019 workshop, allowing more time for workshop dataset preparation.

## **RELATED PROJECTS**

The Living Marine Resources (LMR) Program (Contract N39430-14-C-1440 from the Naval Facilities Engineering Command) provided support for workshop dataset development and establishment of metrics for detection and classification algorithm assessment.